



# Simple and Complex Queries using Relational Algebra

# Company DB Schema

- Employee(Fname, Minit, Lname, Empid, Bdate, Address, Sex, Salary, SuperNo, Dno)
- Department(Dnum, Dname, Mgrid, Mgrdate)
- Works\_on(Essn, Pno, Hours)
- Project(Pnumber, Pname, Plocation, Dnum)
- Dependent(Essn, DepenName, Sex, Bdate, Relationship)
- Dept\_locations(dnum, Location)

# Example

- Retrieve the name and address of all employees who work for the 'Research' department.

Research\_Dept  $\leftarrow \sigma_{Dname = 'Research'}(Department)$

Research\_Emps  $\leftarrow (Research\_Dept \bowtie_{Dnum=Dno} Employee)$

Result  $\leftarrow \pi_{Fname, Lanme, Address}(Research\_Emps)$

# Example

- For every project located in 'Colombo' list the project number, the controlling department number and the dept manager's last name, address and b'date.

Colombo\_Projs  $\leftarrow \sigma_{Plocation = 'Colombo'}(\text{Project})$

Contr\_Dept  $\leftarrow (\text{Colombo_Projs} \bowtie_{Dnum=Dnumber} \text{Department})$

Proj\_Dept\_Mgr  $\leftarrow (\text{Contr_Dept} \bowtie_{MgrId=Empid} \text{Employee})$

Result  $\leftarrow \pi_{Pnumber, Dnum, Lanme, Address, Bdate}(\text{Proj_Dept_Mgr})$

# Example

- Find the names of employees who work on all the projects controlled by dept. no. 5

$$\begin{aligned} \text{Dept5\_Projs}(Pno) &\leftarrow \pi_{Pnumber} (\sigma_{Dnum = 5}(\text{Project})) \\ \text{Emp\_Proj}(\text{Empid}, Pno) &\leftarrow \pi_{Essn, Pno} (\text{Works\_on}) \\ \text{Result\_Emp\_Empid} &\leftarrow (\text{Emp\_Proj} \div \text{Dept5\_Proj}) \\ \text{Result} &\leftarrow \pi_{Lname, Fname} (\text{Result\_Emp\_Empid} * \text{Employee}) \end{aligned}$$

# Examples

- Make a list of project numbers for projects that involve an employee whose last name is 'Perera' either as a worker or as a manager of the dept. that controls the project.

# Examples



- $\text{Perera}(\text{Essn}) \leftarrow \pi_{\text{Empid}} (\sigma_{\text{Lname} = \text{'Perera'}} (\text{Employee}))$
- $\text{Perera\_Worker\_Proj} \leftarrow \pi_{\text{Pno}} (\text{Works\_on} * \text{Perera})$
- $\text{Mgrs} \leftarrow \pi_{\text{Lname}, \text{Dnum}} (\text{Employee} \bowtie_{\text{Empid} = \text{Mgrid}} \text{Department})$
- $\text{Perera\_Managed\_Depts} \leftarrow \pi_{\text{Dnum}} (\sigma_{\text{Lname} = \text{'Perera'}} (\text{Mgrs}))$
- $\text{Perera\_Mgr\_Projs}(\text{Pno}) \leftarrow \pi_{\text{Pnumber}} (\text{Perera\_Managed\_Depts} * \text{Project})$
- $\text{Result} \leftarrow (\text{Perera\_Worker\_Proj} \cup \text{Perera-Mgr\_Projs})$

# Examples

- Retrieve the name of employees who have no dependents.

$\text{All\_emps} \leftarrow \pi_{\text{SSN}}(\text{Employee})$

$\text{Emps\_with\_deps}(\text{SSN}) \leftarrow \pi_{\text{ESSN}}(\text{Dependent})$

$\text{Emps\_without\_deps} \leftarrow (\text{All\_emps} - \text{Emps\_with\_deps})$

$\text{Result} \leftarrow \pi_{\text{Lname, Fname}}(\text{Emps\_without\_deps} * \text{Employee})$

# Examples

- List the names of managers who have at least one dependent.

$$\text{Mgrs}(\text{SSN}) \leftarrow \pi_{\text{MGRSSN}}(\text{Department})$$
$$\text{Emps\_with\_deps}(\text{SSN}) \leftarrow \pi_{\text{ESSN}}(\text{Dependent})$$
$$\text{Mgrs\_with\_deps} \leftarrow (\text{Mgrs} \cap \text{Emps\_with\_deps})$$
$$\text{Result} \leftarrow \pi_{\text{Lname, Fname}}(\text{Mgrs\_with\_deps} * \text{Employee})$$